

TABLE 3.—Total, I_m and screened, I_v , I_r , solar radiation intensity measurements, obtained during June 1934, and determinations of the atmospheric turbidity factor, β , and water-vapor content, w =depth in millimeters, if precipitated—Continued

BLUE HILL METEOROLOGICAL OBSERVATORY OF HARVARD UNIVERSITY—Continued													
Date and hour angle	Solar altitude	Air mass	I_m	I_v	I_r	β_{I_m-r}	β_{I_r-r}	β_{mean}	$I_{w=0}$	$I_{w=0}-I_m'$	w	Air mass type	
									1.94	1.94			
									Percent of solar constant				
<i>1934</i>													
<i>June 26</i>	' °	<i>m</i>	<i>Gr. cal.</i>	<i>Gr. cal.</i>	<i>Gr. cal.</i>						<i>mm</i>		
2:17 a...	55 57	1.20	1.395	0.944	0.749	0.040	0.058	0.049	82.4	8.1	4.8	<i>Pc, Tg</i> ap-	
2:00 a...	58 47	1.17	1.395	.961	.753	.040	.012	.026	86.2	11.9	28.5	proaching	
1:29 a...	63 36	1.11	1.425	.958	.740	.026	.012	.019	87.9	12.0	32.0	aloft.	
<i>June 29</i>													
2:28 a...	54 00	1.24	1.002	.688	.550	.150	.190	.170	66.0	13.6	43.0	<i>Tc.</i>	
2:06 a...	58 22	1.18	.993	.688	.550	.197	.200	.184	65.8	12.9	38.0		
<i>June 30</i>													
3:18 a...	44 57	1.41	1.291	.880	.681	.033	.050	.042	81.4	12.2	25.0	<i>N_{pc}, Tg</i>	
2:49 p...	50 53	1.28	1.220	.936	.654	.071	.075	.073	77.8	12.5	30.0	aloft.	
3:57 p...	37 46	1.63	1.078	.758	.586	.077	.070	.074	73.3	14.2	42.5		

NOTE.—For the significance of the symbols in column headed "Air mass types, see Willett, H. C., American Air Mass Properties. Papers on Physical Oceanography and Meteorology. Published by the Massachusetts Institute of Technology and Woods Hole Oceanographic Institution. Vol. 2, Cambridge, Mass., June 1933.

Atmospheric conditions during solar radiation measurements

BLUE HILL METEOROLOGICAL OBSERVATORY OF HARVARD UNIVERSITY

Date and time from apparent noon	Air temperature °C.	Wind (Beaufort scale)	Visi- bility	Sky blue- ness	Clouds and remarks
June 1934					
2, 3:23 a.m.	24.4	SW 5	6-7	5	1 Ci, 1 Acu; gusty.
2, 2:28 a.m.	25.6	SW 6	6-7	5	1 Ci, 1 Acu; gusty.
2, 2:12 p.m.	28.9	SW 5		5	1 Ci; dense haze.
6, 2:04 a.m.	25.6	WSW 5	7	6	2 Ci, few Freu; haze.
6, 0:23 a.m.	26.7	SW 6	7	6	1 Ci, 1 Cu; light haze, very gusty.
7, 4:04 p.m.	17.8	NNW 1	8	6	1 Cu; light haze.
7, 5:10 p.m.	18.3	NW 3	8-9	7	1 Ci, few Cu.
8, 1:57 p.m.	19.4	W&N 1	8-9	6	3 Ci; very clear.
8, 3:36 p.m.	20.0	SW&W 3		7	Few Cu; sea breeze.
8, 4:30 p.m.	17.8	SW 4		7	4 Cist.
10, 0:25 a.m.	25.0	W 3	8	6	3 Ci, Cieu, few Cu; Cieu 10° from sun, apparently changing.
11, 1:28 a.m.	21.7	W&N 3	8	6	2 Acu, 2 Cu 10° from sun.
11, 2:30 p.m.	23.9	W&N 3	9	7	3 Cu, 1 Acu; gusty.
11, 3:28 p.m.	23.9	W&N 2	8-9	7	1 Ci, 2 Cu.
12, 1:01 a.m.	15.6	E&N 1			3 Cieu, few Cu; dense haze.
14, 4:00 a.m.	15.6	NW 4		7	2 Acu; light haze, gusty.
14, 2:35 a.m.	18.3	NW 1		7	1 Acu, 3 Cu, Steu; thin Freu over sun spoiled one reading.
15, 4:20 a.m.	16.7	WNW 2	8		3 Ci, Cist, Cieu; Cist layer over sun before last reading completed.
15, 0:45 a.m.	18.3	NW 2	8-9		1 Ci, 2 Acu, few Cu, 5 Freu; thin Acu over sun during last cooling.
15, 1:30 p.m.	16.7	WNW 5	7-8		Few Cist; Cu, Freu near sun.
16, 3:33 a.m.	18.9	NW 2	8	6	2 Acu, 1 Cu.
16, 0:50 a.m.	17.2	NE 4			2 Cu, Freu, Acu; sun clear; haze on all horizon.
16, 0:12 a.m.	17.2	NE 4	7-8		
16, 2:10 p.m.	16.1	NE 4	7-8		Few Cu, Freu; 1 Acu 10° from sun.
17, 3:00 a.m.	13.3	NW 1	7	7	4 Cu.
17, 0:45 a.m.	18.3	NE 1	8	7	3 Cu.
17, 0:52 p.m.	20.6	NE 1	9	8	Few Acu, 3 Cu; light haze.
17, 5:11 p.m.	21.1	ESE 1	9	7	1 Ci, few Cu.
18, 5:12 a.m.	16.1	W 2	9	8	Few Ci.
18, 2:58 a.m.	18.9	WSW 1	9	8	Few Ci.
18, 1:00 a.m.	23.9	S&W 1	9	8	Few Ci, 3 Cu.
18, 3:25 p.m.	23.9	S&W 4	9	8	1 Ci, few Cu.
20, 3:37 a.m.	16.1	NNW 5	10	8	6 Cu, Steu.
20, 0:50 p.m.	22.2	NW 6	9	7	5 Cu.
20, 3:28 p.m.	23.3	NW 4	9		2 Cu.
22, 4:06 a.m.	22.2	WNW 4	9		2 Ci, few Acu.
22, 3:28 a.m.	21.7	WNW 4	8-9		Few Ci, Cist on horizon.
22, 2:04 a.m.	21.1	WNW 4			2 Ci, Cist, Cieu.
22, 1:00 p.m.	23.9	WSW 2	9		2 Ci, Cist near sun.
22, 3:28 p.m.	25.0	WNW 3	9		Few Cu, 1 Ci.
23, 4:23 p.m.	18.3	NE 0	6		1 Freu; fumulus 4° from sun.

Atmospheric conditions during solar radiation measurements—Con.

BLUE HILL METEOROLOGICAL OBSERVATORY OF HARVARD UNIVERSITY—Continued

Date and time from apparent noon	Air temperature °C.	Wind (Beaufort scale)	Visi- bility	Sky blue- ness	Clouds and remarks
June 1934					
24, 1:45 a.m.	22.2	SW 3	7	7	5 Ci; dense haze.
25, 3:20 a.m.	21.7	W 2	8	7	Few Ci; light haze.
25, 2:43 a.m.	22.2	W 2	8		Light haze.
25, 1:00 a.m.	23.3	WNW 3	8		Few Cu, increasing; light haze.
25, 2:54 p.m.	24.4	WNW 4	8-9		5 Steu, St, Freu; light haze.
25, 4:16 p.m.	24.4	WNW 4-5	9		5 Steu, St, Freu.
26, 2:17 a.m.	22.2	NW 3	9	7	4 Ci, 2 Acu.
26, 1:29 a.m.	22.8	NW 2	9	7	4 Ci, few Acu.
29, 2:28 a.m.	27.8	SW 3	5	5	7 Ci; dense haze.
30, 2:49 a.m.	28.9	W 1	8	8	5 Ci.
30, 2:49 p.m.	29.4	WSW 2	8-9		1 Cu.
30, 3:57 p.m.	28.9	WSW 2	8-9		3 Cu, 1 Ci, Cist approaching sun.

POSITIONS AND AREAS OF SUN-SPOTS

[Communicated by Capt. J. F. Hellweg, U.S. Navy, Superintendent U.S. Naval Observatory. Data furnished by the U.S. Naval Observatory in cooperation with Harvard and Mount Wilson Observatories. The difference in longitude is measured from the central meridian, positive west. The north latitude is positive. Areas are corrected for foreshortening and are expressed in millionths of the sun's visible hemisphere. The total area for each day includes spots and groups.]

Date	Eastern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- itude	Spot	Group		
1934								
May 1	h. m.	°	°	°				
May 1	11 14		No spots					U.S. Naval.
May 2	11 3		Do.					Mount Wilson.
May 3	10 58		Do.					Do.
May 4	13 44	-19.5	86.9	-20.5		46	46	U.S. Naval.
May 5	11 11	-6.0	88.6	-20.5		62	62	Do.
May 6	13 15	+9.0	89.2	-21.0		225	225	Mount Wilson.
May 7	11 12	+23.0	91.1	-20.5		62	62	U.S. Naval.
May 8	11 12	-27.0	27.9	+7.0	15			Do.
		+36.0	90.9	-20.5		93	108	
May 9	11 25	+51.0	92.6	-20.5		93	93	Do.
May 10	11 25	+65.0	93.3	-20.0		77	77	Do.
May 11	11 30	+75.0	90.0	-20.0		89	89	Mount Wilson.
May 12	11 34		No spots					U.S. Naval.
May 13	13 12	-78.0	269.7	-30.0		463	463	Do.
May 14	11 9	-65.0	270.6	-30.5		556	556	Do.
May 15	9 0	-57.0	266.6	-30.0	146			Mount Wilson.
		-53.0	270.6	-33.0		458	604	
May 16	11 40	-38.0	270.9	-30.5		494	494	U.S. Naval.
May 17	11 10	-75.0	220.9	+29.0		123		Do.
		-25.0	270.9	-30.5		494	617	
May 18	11 8	-60.0	222.7	+28.0		154		Do.
		-12.0	270.7	-30.5		401	555	
May 19	11 7	-46.0	223.5	+28.0		185		Do.
		+1.0	270.5	-31.0		278	463	
May 20	12 1	-31.0	224.8	+28.0	154			Do.
		+14.0	269.8	-31.0		216	370	
May 21	10 59	-18.0	225.1	+28.0	154			Do.
		+26.0	239.1	-31.0		185	339	
May 22	11 13	-39.5	199.2	+12.5	15			Do.
		-5.5	224.2	+28.0	154			
		+39.0	268.7	-31.0		154	323	
May 23	11 23	+8.0	224.4	+28.0	123			Do.
		+53.0	269.4	-31.0		93	216	
May 24	11 25	+20.0	223.2	+28.0	93			Do.
		+65.0	268.2	-31.0		77	170	
May 26	12 18	+44.8	221.0	+28.0	1,070		1,070	Harvard.
May 27	11 15	+58.0	221.5	+26.0	194		194	Mount Wilson.
May 28	11 47	+70.0	220.0	+28.0	62		62	U.S. Naval.
May 29	12 0		No spots					Mount Wilson.
May 30	13 27		Do.					U.S. Naval.
May 31	10 35		Do.					Do.
Mean daily area for 30 days							242	
June 1	11 22		No spots					Do.
June 2	11 13		Do.					Do.
June 3	11 44		Do.					Do.
June 4	11 25		Do.					Do.
June 5	13 20		Do.					Do.
June 6	11 15		Do.					Do.
June 7	13 26		Do.					Do.
June 8			Do.					Harvard.
June 9			Do.					Do.
June 10	10 18		Do.					U.S. Naval.
June 11	13 36		Do.					Do.
June 12	9 15		Do.					Mount Wilson.
June 13	11 15		Do.					U.S. Naval.
June 14	11 17		Do.					Do.
June 15	13 15	-71.0	200.0	+3.0		185	185	Do.
June 16	11 56	-58.0	200.5	+3.0		185		Do.
		-10.0	248.5	-30.0		39	224	

POSITIONS AND AREAS OF SUN-SPOTS—Continued

Date	Eastern stand- ard time	Heliographic			Area		Total area for each day	Observatory
		Diff. in longi- tude	Longi- tude	Lat- itude	Spot	Group		
1934	<i>h. m.</i>	°	°	°				
June 17	12 32	-43. 0	201. 9	+3. 0		185	216	U.S. Naval.
		+4. 5	249. 4	-30. 0		31		
June 18	11 10	-27. 0	205. 4	+3. 0		209		Mount Wilson.
		+18. 0	250. 4	-29. 0		9	218	
June 19	13 12	-15. 0	203. 1	+2. 5		170	170	U.S. Naval.
June 20	11 6	-3. 0	203. 0	+2. 5		170	170	Do.
June 21	11 14	+14. 0	206. 7	+2. 5	120		123	Do.
June 22	13 30	+28. 5	206. 7	+2. 5	100		100	Do.
June 23	12 4	+41. 0	206. 8	+2. 5	93		93	Do.
June 24	12 6	+54. 5	207. 0	+2. 5	69		69	Do.
June 25	13 15	+68. 0	206. 6	+2. 5	46		46	Do.
June 26	11 10	+82. 0	208. 5	+2. 5	46		46	Do.
June 27	11 8	No spots						Do.
June 28	13 18	Do.						Do.
June 29	11 15	Do.						Do.
June 30	11 11	Do.						Do.
Mean daily area for 30 days							55	

PROVISIONAL SUN-SPOT RELATIVE NUMBERS FOR JUNE 1934

(Dependent alone on observations at Zurich and its station at Arosa)

[Data furnished through the courtesy of Prof. W. Brunner, Eidgenössische Sternwarte, Zurich, Switzerland]

June 1934	Relative numbers	June 1934	Relative numbers	June 1934	Relative numbers
1	0	11	0	21	16
2	0	12	0	22	10
3	0	13	0	23	10
4	0	14	d 0	24	8
5	0	15	11	25	8
6	0	16	27	26	8
7	0	17	30	27	0
8	0	18	26	28	0
9	7	19	25	29	0
10	0	20	b 14	30	0

Mean: 30 days=6.7.

b= Passage of a large group or spot through the central meridian.

d= Entrance of a large or average-sized center of activity on the east limb.

AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. Little, in Charge]

By L. T. SAMUELS

Free-air temperatures during June averaged mostly above normal, the largest departures occurring at Omaha. In striking contrast to the large positive departures at this station, those at Pembina to the northward were close to normal, being slightly below in the lower levels and slightly above in the higher levels. At Pensacola and San Diego, representing the Gulf and lower Pacific coast regions, respectively, the free-air temperatures averaged below normal. Relative humidity departures were in general of opposite sign to those of temperature with the largest values occurring at Pensacola and San Diego.

In connection with the difference in temperature departures at Omaha and Pembina as mentioned above, it is interesting to note that the resultant wind directions for the month at Omaha contained an appreciably greater south component than normal between the 1,000- and 4,000-meter levels and that the resultant velocities were considerably above normal at the latter station. Marked southerly components as compared to normal occurred in the resultant winds at a number of southern stations.

TABLE 1.—Free-air temperatures and relative humidities obtained by airplanes during June 1934

TEMPERATURES (° C.)

Altitude (meters) m.s.l.	Cleveland, Ohio ¹ (246 meters)		Dallas, Tex. ² (146 meters)		Norfolk, Va. ³ (3 meters)		Omaha, Nebr. ⁴ (300 meters)		Pembina, N. Dak. ⁵ (243 meters)		Pensacola, Fla. ³ (2 meters)		San Diego, Calif. ³ (5 meters)		Washington, D. C. ³ (2 meters)	
	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal	Mean	Departure from normal
Surface	18.9		24.6	(°)	25.4	+2.2	19.8	(°)	11.9	(°)	25.6	+0.5	18.9	-0.7	21.2	-1.2
500	20.5		25.3	(°)	23.3	+1.7	21.7	(°)	13.9	(°)	22.6	-6	14.6	-1.7	21.7	+1.3
1,000	19.8	+4.0	23.8	+3.5	21.1	+1.8	22.8	+4.8	13.2	-0.9	19.7	-8	12.8	-4.1	20.1	+1.9
1,500	17.5	+4.5	20.5	+2.5			20.4	+5.0	11.0	-7						
2,000	15.1	+4.6	17.5	+2.0	14.3	+1.0	17.2	+4.5	9.3	+5	14.0	-8	14.0	-2.5	15.9	+3.2
2,500	12.3	+4.5	14.7	+1.8			13.4	+3.7	6.7	+7						
3,000	9.2	+4.1	12.0	+1.9	8.9	+1.0	9.5	+2.8	3.9	+8	8.5	-7	9.4	-1.6	10.3	+3.1
4,000	2.7	+2.9	5.1	+7			2.2	+1.9	-2.0	+1	3.6	-1	3.2	-1.3	3.3	+2.4
5,000	-3.5	+2.6	-2.4	-5			-4.9	+8	-7.9	+2	-1.7	+4			-3.6	+2.3

RELATIVE HUMIDITY (PERCENT)

Surface	76		74	(°)	75	+1	79	(°)	86	(°)	85	+5	70	+1	79	+11
500	65		69	(°)	68	+1	67	(°)	74	(°)	81	+7	80	+3	69	+6
1,000	57	-10	63	-6	64	+1	53	-11	66	+1	78	+10	76	+18	66	+6
1,500	56	-10	63	+4			50	-11	60	-2						
2,000	52	-10	58	+7	63	+3	47	-11	54	-6	77	+14	38	+13	65	+5
2,500	52	-5	48	+1			49	-7	53	-5						
3,000	49	-4	41	-2	49	-3	50	-4	56	+1	70	+17	29	+12	53	0
4,000	50	+4	40	+1			52	0	54	+6	64	+18	25	+10	53	+5
5,000	47	+7	39	-4			47	-5	49	9	56	+17			40	+5

Times of observations: Weather Bureau, 5 a.m.; Navy, 7 a.m.; E. S. T.

¹ Temperature departures based on normals determined by extrapolating latitudinally those of Royal Center, Ind., and Due West, S.C. Humidity departures based on normals of Royal Center, Ind.² Temperature departures based on normals determined by interpolating latitudinally those of Groesbeck, Tex., and Broken Arrow, Okla. Humidity departures based on normals of Groesbeck, Tex.³ Naval air stations.⁴ Temperature and humidity departures based on normals of Drexel, Nebr.⁵ Temperature departures based on normals determined by extrapolating latitudinally those of Ellendale, N. Dak., and Drexel, Nebr. Humidity departures based on normals of Ellendale, N. Dak.⁶ Surface and 500-meter departures omitted because of difference in time of day between airplane observations and those of kites upon which the normals are based.